

sensitive surface 26 for added protection. The cover plate 31 may also be placed above the cover 51 for some applications, or the cover 51 may be formed into a cover plate 31, although this is less preferable because it may increase the distance between the cover 51 and the touch pad's touch-sensitive surface 26 and thereby decrease reliability. The cover plate 31 is preferably transparent allowing visual indications of the touch-sensitive zones (e.g., made with ink) on the surface of the touch pad 21 to be visible through the cover plate 31. However, transparency is not required as the cover plate 31 can be marked to indicate such zones, tactile feedback means previously discussed may be used, or no indication of touch-sensitive zones may be also preferable in some applications. It is also preferable, where a completely waterproof and dust proof enclosure is desired, to seal the touch pad cables (not shown) and provide a system with no mechanical buttons.

[0042] In the embodiment of FIG. 2, the base 43 further comprises a touch pad cable aperture 55 sufficient to house a touch pad cable 57 (see, FIG. 4). The touch pad cable aperture 55 is sealed (e.g., made waterproof and dust proof) by a cable gasket 59 placed within the touch pad cable aperture 55 around the touch pad cable 57 (FIG. 4). The waterproof and dust proof nature of the touch pad enclosure 41 can be further reinforced by the use of adhesive or other sealant in relation to the touch pad cable aperture 55, touch pad cable 57 (not shown) and cable gasket 59. Although it is not required for the invention, the cover 51 and cover gasket 53 are preferably affixed to the base and touch pad by adhesive for a better seal. The touch pad cable 57, may optionally be sealed with a protective layer to further prevent contamination.

[0043] The cover 51 can be manufactured to engage the base 43 in a way that secures the cover 51 to the base 43 and creates a seal through the cover gasket 53 (e.g., a snapfit, adhered, or screwed-on cover). The base 43 and cover 51 may be formed of a polymer, or of a metal such as aluminum. If a metal is used, an additional layer of insulative material preferably should be placed so as to insulate the touch pad touchsensitive surface 26 from the metal. Similarly, gaskets 53 and 59 and methods of their manufacture are well known in the art.

[0044] For a sealed system, the cover 51 or the cover gasket 53 preferably overlaps the touch pad boundary 33 sufficient to create a watertight and dust tight seal, and is associated with the base 43, which in addition to other seals described herein, serves to completely seal the touch pad circuitry from external contamination. If the touch pad 21 is to be used in an area where bacterial or chemical contamination is a concern and seams are undesirable due to the nature of the potential contamination, the cover plate 31 may alternatively include an entire panel having no seams or apertures. In this case, the touch pad 21 is preferably adhered to the back of the panel by an adhesive or supported by a structure, the monitor also being placed behind the panel and supported by a structure.

[0045] FIG. 3 depicts a top view of the touch pad 21 showing a touch pad boundary 33, a relative cursor positioning zone 27, and an enter/select zone 29. An optional scroll zone 61 is also included. The enter/select zone boundary 67 is preferably raised for tactile feedback, or the enter/select zone 29 may be textured. The scroll zone 61 and

the relative cursor positioning zone 27 may also have textured or raised portions for providing tactile feedback in addition to, or instead of the tactile feedback provided over the enter/select zone 67.

[0046] Alternatively, the tactile feedback 69 may be provided on the surface of the cover plate 31 (see, FIG. 4). As depicted in the embodiment of FIG. 4, the cover plate 31 rests immediately above the touch pad 21 and tactile feedback 69 preferably corresponds to the appropriate zones on the touch pad's touch-sensitive surface 26. The enter/select zone 29 may also be indicated to the user by a printed pattern on the reverse side of the cover plate 31, away from the operator's touch, marked preferably with the word "enter" in red ink and a circle indicating the boundary of the enter/select zone (see, FIG. 3). Similarly, the scroll zone 61 can be indicated by an ink drawing in the location of the scroll zone 61. Ink on the cover plate 31 may also be used to provide decorative designs or a logo.

[0047] In a preferred embodiment, the cover plate 31 is a thin sheet of glass, the front surface of which is frosted by blasting, acid etching or other well-known process. The frosted texture is comfortable to the touch by reducing the friction between the finger and the glass surface. In this case, a pattern in the etching may be used to indicate the enter/select zone 29 or the scroll zone 61. This etching pattern may be combined with the use of an ink pattern on the back side of the glass. The back side of the glass is preferably frosted to increase adhesion of the ink pattern and increase the adhesive effectiveness if adhesive is used to affix the cover plate 31 to the touch pad 21.

[0048] A thin overlay of plastic, such as is commonly used on touch pads, may alternatively be used as a cover plate 31 instead of glass. In this case, the enter/select zone 29 and scroll zone 61 may be indicated either by a change in the texture of the surface as described in International Publication Number WO 9718546 to Gerpheide (filed Nov. 12, 1996,) or by an embossing or debossing process used to create a ridge in the plastic. Either of these approaches has the advantage of being easily detected by an operator's touch. Alternatively, the zones may be indicated by ink printing, preferably on the reverse side of the clear plastic overlay.

[0049] FIG. 4 depicts an embodiment of the touch pad 21 where the touch pad's electronic components 45 are mounted on the reverse side of the touch pad 21. This embodiment also includes an optional speaker 71 for auditory feedback. The speaker 71 is preferably a piezo alarm or other device known in the art which can be directly attached to the touch pad 21 for immediate response when a pre-designated region of the touch pad's touch-sensitive surface 26 is selected. By directly attaching the speaker to the touch pad 21 such that the auditory feedback is not subject to a main microprocessor's processing speed, a user is truly given immediate feedback. It is contemplated, however, that the main processor may also be used to produce a sound for auditory feedback. Optionally, a device programmed to emit a flash of light or illuminate as visual feedback could also be incorporated into the embodiment to indicate when a zone has been selected for additional useful feedback. An example of such visual feedback is given in co-owned, co-pending U.S. patent application Ser. No. 08/923,677 to Glad (filed Sep. 4, 1997). FIG. 4 also depicts a touch pad